



Bank funding structures and risk: Evidence from the global financial crisis[☆]



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ABSTRACT

This paper analyzes the evolution of bank funding structures in the run up to the global financial crisis and studies the implications for financial stability, exploiting a bank-level dataset that covers about 11,000 banks in the U.S. and Europe during 2001–09. The results show that banks with weaker structural liquidity and higher leverage in the pre-crisis period were more likely to fail afterward. The likelihood of bank failure also increases with pre-crisis bank risk-taking. In the cross-section, the smaller domestically-oriented banks were relatively more vulnerable to liquidity risk, while the large cross-border (Global) banks were more vulnerable to solvency risk due to excessive leverage. In fact, a 3.5 percentage point increase in the pre-crisis capital buffers of Global banks would have caused a 48 percentage point in their probability of failure during the crisis. The results support the proposed Basel III regulations on structural liquidity and leverage, but suggest that emphasis should be placed on the latter, particularly for the systemically-important institutions. Macroeconomic and monetary conditions are also shown to be related with the likelihood of bank failure, providing a case for the introduction of a macro-prudential approach to banking regulation.

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1. Introduction

The prevalence of bank failures during the global financial crisis casted doubts on the quality of bank risk management practices and triggered a deep revision of the regulatory and supervisory frameworks governing bank liquidity risk and capital buffers. Regulatory initiatives at the international level included, *inter alia*, the introduction of liquidity standards for internationally-active banks, binding leverage ratios, and a revision of capital requirements

under Basel III (BCBS 2009, 2010a,b).¹ In addition to these micro-prudential measures, academics and policymakers argued for the introduction of a complementary macro-prudential framework to help safeguard financial stability at the systemic level (Hanson et al., 2010).

This intrusive regulatory response was implicitly based on two premises. First, the view that individual bank decisions regarding the size of their liquidity and capital buffers in the run up to the crisis were not commensurate with their risk-taking—and were therefore suboptimal from the social perspective. Second, the perception that the costs of bank failures spanned beyond the interests of their direct stakeholders due, for example, to the presence of supply-side effects in credit markets, or network externalities in the financial sector (Brunnermeier, 2009).

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¹ On liquidity, the proposals comprise two prudential ratios that entail minimum binding standards: a Liquidity Coverage Ratio (LCR), aimed at promoting banks' resilience to liquidity risk over the short-term (a 30-day period); and a Net Stable Funding Ratio (NSFR), aimed at promoting resilience over a one-year horizon. In addition, a leverage ratio computed as shareholders' capital over total assets was introduced to ensure a hard minimum capital level, regardless of the structure of risk-weights in bank balance sheets.

The widespread bank failures in the U.S. and Europe at the peak of the global financial crisis provided casual support to the first premise. Still, empirical work on the connection between bank liquidity and capital buffers and their subsequent probability of failure is relatively scarce and overlooks potential differences across bank types. Background studies carried out in the context of Basel III proposals, which are based on aggregate data, concluded that stricter regulations on liquidity and leverage were likely to ameliorate the probability of systemic banking crises (BCBS, 2010b).² In turn, studies based on micro data for U.S. banks also support the notion that banks with higher asset liquidity, stronger reliance on retail insured deposits, and larger capital buffers were less vulnerable to failure during the global financial crisis (Berger and Bouwman, 2010; Bologna, 2011). Similar results are reported in Ratnovski and Huang (2009), based on data for large banks from the OECD.

This paper makes two contributions to this literature. First, it measures structural liquidity and leverage in bank balance sheets in a way consistent with the formulations of the Net Stable Funding Ratio (NSFR), and the leverage ratio (EQUITY) proposed in Basel III. In addition, it explores for systematic differences in the relationship between structural liquidity, leverage, and subsequent probability of failure across bank types. In particular, we distinguish between large, internationally-active banks (henceforth Global banks), and (typically smaller) banks that focus on their domestic retail markets (henceforth Domestic banks).

This sample partition is suitable from the financial stability perspective. Typically, Global banks are systemically important and extremely challenging to resolve, due to the complexity of their business and legal structures, and because their operations span across borders, bringing in cross-country differences in bank resolution frameworks and difficult fiscal considerations. Furthermore, the relative role of liquidity and capital buffers for bank financial soundness is likely to differ systematically across these two types of banks. All else equal, Global banks benefit from the imperfect co-movement of macroeconomic and monetary conditions across geographic regions (Griffith-Jones et al., 2002; García-Herrero and Vazquez, 2013) and may exploit their internal capital markets to relocate liquidity and capital between business units. In addition, Global banks tend to enjoy a more stable funding base than Domestic banks due to flight to safety, particularly during times of market distress. To the extent that these factors are incorporated in bank risk management decisions, optimal choices on structural liquidity and leverage are likely to differ across these two types of banks.

The paper exploits a bank-level dataset that covers about 11,000 U.S. and European banks from 2001 through 2009. This sample coverage allows us to study bank dynamics leading to, and during, the global financial crisis. As a by-product, we document the evolution of structural liquidity and leverage in the pre-crisis period, and highlight some patterns across bank types to motivate further research. Contrary to our expectations, the average structural liquidity in bank balance sheets in the run up to the global financial crisis (as measured by a proxy of the NSFR) was close to the target values proposed in Basel III recommendations.³ However, we find a wide dispersion in structural liquidity across banks and a systematic pattern: a mild (albeit sustained) increase in structural liquidity mismatches in the run up to the crisis was driven by banks located at the lower extreme of the distribution. Pre-crisis leverage was also widely uneven across banks, with Global

banks displaying thinner capital buffers and wider gaps between leverage ratios and Basel capital to risk-weighted assets.

In line with alleged deficiencies in bank risk management practices, we find that banks with weaker structural liquidity or higher leverage ratios in the run up to the crisis were more vulnerable to failure, after controlling for their pre-crisis risk-taking. The benefits of stronger liability structures are substantial for the banks located at the lower extremes of the distributions. In addition, we find systematic differences in the relative importance of liquidity and leverage for financial fragility across groups of banks. Global banks were more susceptible to failure on excessive leverage, while Domestic banks were more susceptible to failure on weak structural liquidity (i.e., excessive liquidity transformation) and overreliance on short-term wholesale funding.

In the estimations, we include a set of bank-level controls for pre-crisis risk taking, and for country-specific macroeconomic conditions (common to all banks incorporated in a given country). The use of controls for pre-crisis risk-taking is critical to this study: to the extent that banks carry out proper risk management, more aggressive risk-taking would tend to be associated with stronger liquidity and capital buffers. Failing to account for this would introduce a bias to the results. In fact, we find that banks engaging in more aggressive risk taking in the run-up to the crisis—as measured by the rate of growth of their balance sheets, their reliance on trading revenues, and their pre-crisis distance to default—were more likely to fail afterward. Macroeconomic conditions in the pre-crisis period are also found to affect bank probabilities of default, suggesting that banks may have failed to internalize risks stemming from overheated economic activity and loose monetary conditions.

The results are robust to a variety of alternative specifications. First and foremost, to account for potentially large heterogeneity among Domestic banks in terms of size, business models, and pre-crisis risk taking, we compute a set of parallel regressions based on the subsets of failing and surviving institutions that have common support in terms of size and pre-crisis risk taking.⁴ In addition, we carry out a series of parallel regressions using two alternative measures of bank liquidity and capital, and we also explore with alternative definitions of bank failure.

All in all, these results provide grounds to the proposed regulations on liquidity and capital, and to the introduction of a macroprudential approach to bank regulation. From the financial stability perspective, however, the evidence indicates that regulations on capital—particularly limits on leverage for the larger banking groups—are likely to be more relevant.

The remainder of the paper is as follows. Section 2 places the paper in the context of the literature. Section 3 presents the dataset, discusses the criteria for the partition of the sample, and describes some stylized facts on the evolution of liquidity and leverage across groups of banks. Section 4 describes the quantitative results of baseline regressions and a parallel set of exercises with alternative partitions of the sample to assess the extent of cross-sectional differences and non-linear effects. Section 5 presents various robustness checks. Section 6 concludes.

2. Related literature and empirical hypotheses

The theory of financial intermediation shows that liquidity creation is an essential role of banks and establishes a strong connection between liquidity creation and financial stability (Bryant, 1980; Diamond and Dybvig, 1983). Banks create liquidity on both sides of their balance sheets, by financing long-term projects with relatively liquid liabilities such as transaction deposits and short-

² This work also found evidence of non-linear effects at play, as the estimated marginal benefits of stricter regulations seemed to drop with the size of the liquidity and capital buffers.

³ Structural liquidity is measured by the ratio of long-term stable funding sources to structural asset positions.

⁴ We thank an anonymous referee for this suggestion.

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